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Roof panels

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## ABSTRACT

The present invention relates generally to a roof panel 10 including a pan 14 and a pair of opposing flanges 16 and 18, respectively. Each of the flanges 16 and 18 includes an inwardly protruding and longitudinally extending cold reduced rib such as 20 and 22. The ribs 20 and 22 are shaped substantially identical to one another and formed adjacent a free edge of the corresponding flanges 16 and 18. Adjacent roof panels 10 and 12 are connected together via an elongate cap 24 which is fabricated on-site using a conventional seaming machine. The roof panel 10 or 12 is cold roll formed into the channel section profile using conventional roll formers and techniques. The cold reduction of the flanges such as 16 to deform the longitudinal rib such as 20 involves differential stretching of the flange 16 by compressing the flange 16 with a variable force. The cold reduction or stretching of the flange 16 or 18 longitudinally precambers the roofing panel 10 or 12. Corrugation of the flange 16 or 18 is designed to remove the precamber from the roof panel 10 or 12.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

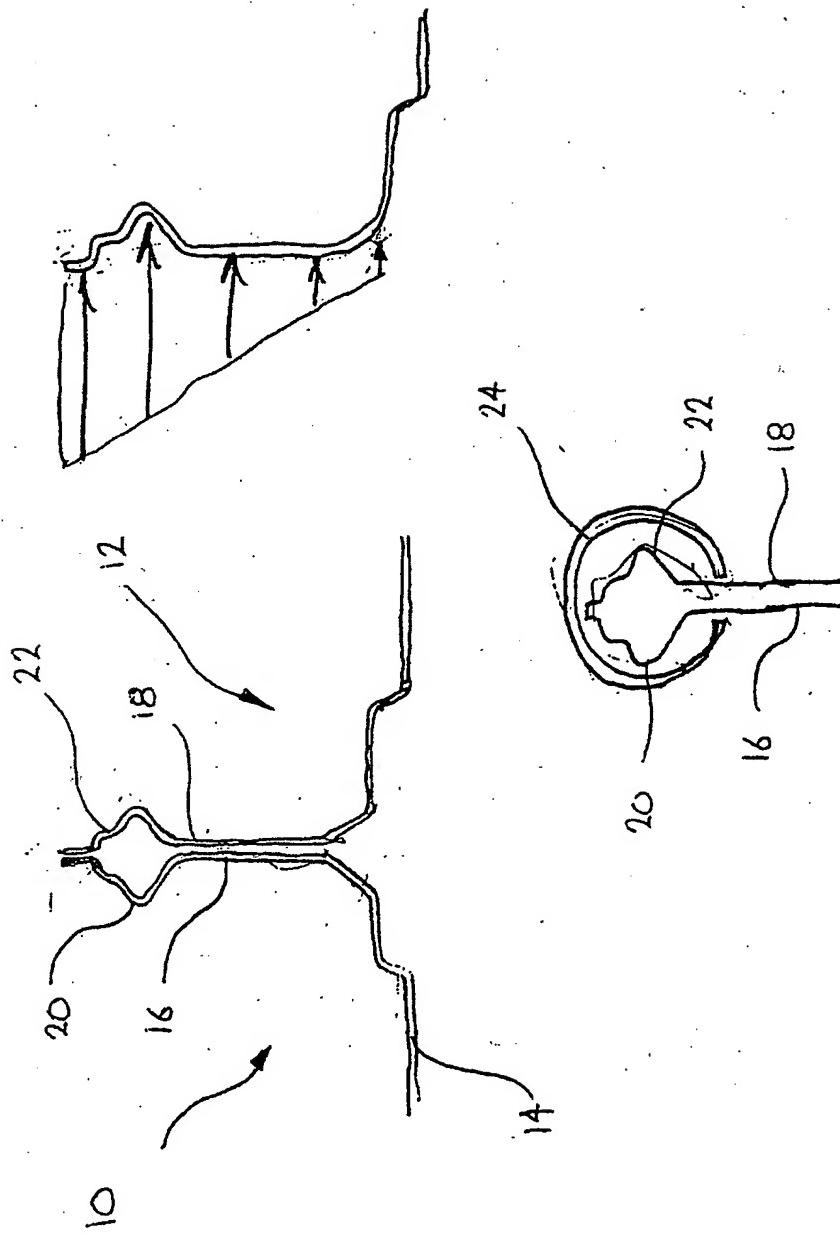


FIG. 1

AUSTRALIA  
Patents Act 1990

**COMPLETE SPECIFICATION  
STANDARD PATENT**

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**Invention Title:**

ROOF PANELS

The following statement is a full description of this invention, including the best method of performing it known to me/us:

ROOF PANELS

**FIELD OF THE INVENTION**

The present invention relates generally to an elongate metal building element and relates particularly, though not exclusively, to metal roof panels.

**SUMMARY OF THE INVENTION**

According to one aspect of the present invention there is provided a method of forming an elongate metal building element of a channel section profile including a pan and a pair of opposing flanges; said method comprising the steps of:

roll forming sheet metal into the channel section profile; and

cold reducing a portion of at least one of the pair of opposing flanges to form an inwardly protruding and longitudinally extending rib, said cold reduction of the flanges longitudinally precambering the building element.

Preferably the method further comprises the step of forming transversely extending corrugations in said at least one of the opposing flanges. More preferably the transverse corrugations are in cross-section tapered longitudinally wherein maximum corrugation is formed adjacent the corresponding rib. Generally the transverse corrugations are effective in removing the precamber from the building element.

Preferably the step of cold reducing involves differentially stretching said portion of the flange to form the rib. More preferably the differential stretching

is effected by compressing the flange with a variable force.

Preferably the method also comprises the step of cold  
5 forming said at least one of the flanges whereby the corrugations are substantially flattened. Generally this cold forming of the flanges is effective in returning the longitudinal precamber to the building element.

10 According to another aspect of the present invention there is provided an elongate metal building element of a channel section profile including a pan and a pair of opposing flanges each having an inwardly protruding and longitudinally extending cold reduced rib, the building  
15 element being precambered longitudinally.

Preferably the elongate metal building element is one of a plurality of said building elements arranged alongside one another. More preferably adjacent building elements are  
20 connected together via an elongate cap being configured to locate about adjacent ribs of the respective and adjacent flanges.

Preferably the elongate metal building element is  
25 constructed of a relatively light gauge and low tensile steel. The metal roofing may be constructed of a pre-coated steel such as that commercially available in Australia under the trademark ZINCALUME.

30 Generally the elongate metal building element is a metal roof panel.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In order to facilitate a better understanding of the nature of the present invention a preferred embodiment of an elongate metal building element and its method of fabrication will now be described, by way of example only, with reference to the accompanying drawings in which:

- Figure 1 is cross-sectional views of adjacent metal building elements together with an enlarged sectional view of an elongate cap; and
- 10      Figure 2 is a schematic flow diagram of the general steps involved in forming one of the building elements of Figure 1.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

- 15      As shown in Figure 1 there is part of a pair of adjacent metal building elements 10 and 12, respectively, each being elongate and of a channel section profile. The metal building elements 10 and 12 of this embodiment are roof panels formed from a relatively light 0.6 mm gauge pre-coated steel such as that commercially available in Australia under the trademark ZINCALUME.

The roof panel such as 10 includes a pan 14 and a pair of opposing flanges 16 and 18, respectively. Each of the flanges 16 and 18 includes an inwardly protruding and longitudinally extending cold reduced rib such as 20 and 22. The ribs 20 and 22 are shaped substantially identical to one another and formed adjacent a free edge of the corresponding flange 16 and 18. Adjacent ribs such as 20 and 22 of adjacent flanges 16 and 18 are aligned with one another and when abutted are together generally rhomboidal in shape. The adjacent roof panels 10 and 12 are connected together via an elongate cap 24. The cap 24 is fabricated

on-site using a conventional seaming machine which deforms  
and squeezes the cap 24 about the adjacent ribs such 20  
and 22. The cap 24 also serves to protect the pre-coated  
steel which may have been damaged during forming of the  
5 ribs such as 20 and 22.

Figure 2 is a schematic block diagram of a preferred  
method of forming an elongate metal building element, in  
this example a roof panel, from sheet metal. The general  
10 steps involved in forming the roof panel such as 10 or 12  
are as follows:

- (i) sheet metal is preferably cold roll formed into a channel-section profile including a pan and a pair of opposing flanges;
- 15 (ii) a free edge portion of the opposing flanges are cold reduced to form an inwardly protruding and longitudinally extending rib;
- (iii) transverse corrugations are formed in the opposing flanges;
- 20 (iv) the ribbed and corrugated roof panel is cut at the required length.

The roof panel 10 or 12 of this embodiment is cold roll formed into the channel section profile using conventional  
25 roll formers and techniques. The cold reduction of the flanges such as 16 to form the longitudinal ribs such as 20 involves differential stretching of the flange 16 by compressing the flange 16 with a variable force. The sheet metal is stretched or elongated up to around 5% and thus  
30 the method is most suited to low tensile or relatively soft steels. Traditionally ribs are formed at the free respective edges of the opposing flanges by roll forming the flange.

The cold reduction or stretching of the flange 16 or 18 longitudinally precambers the roofing panel 10 or 12.

Corrugation of the flange 16 or 18 is designed to remove  
5 the precamber from the roof panel 10 or 12. In this example the transverse corrugations are in cross-section tapered longitudinally with the maximum corrugation being formed adjacent the corresponding rib such as 20 or 22.

The transverse corrugations are formed using a  
10 conventional cold roll former. The precamber is removed in order to facilitate transportation and erection on site.

The ribbed and corrugated roof panel such as 10 and 12 is then cut to the required length. This is effected using a  
15 conventional shearing apparatus. The cut roofing panels such as 10 or 12 can then be stacked or otherwise packed in readiness for transportation.

The roof panels such as 10 or 12 are designed to be  
20 precambered on site. This is effected by "ironing" the corrugations from the flanges 16 and 18 of the roof panel such as 10 or 12. The corrugations are least partly removed by a cold forming device which "irons out" the corrugations in the flanges 16 and 18. The roof panel 10  
25 or 12 then reverts to its precambered condition.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described.

30 For example, the specific sectional profile of the building element may vary provided it is generally of a channel section, for example the pan may include one or more longitudinally extending stiffening ribs. The

sequence of fabrication steps may vary from that described, for example the sheet metal may be cold reduced to form the longitudinally extending ribs and then corrugated prior to roll forming.

5

All such variations and modifications are to be considered within the scope of the present invention the nature of which is to be determined from the foregoing description.

- 10 In the preceding summary of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprising" is used in the sense of "including", that is the features specified may be associated with further features in various
- 15 embodiments of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of forming an elongate metal building element of a channel section profile including a pan and a pair of opposing flanges, said method comprising the steps of:

roll forming sheet metal into the channel section profile; and

10 cold reducing a portion of at least one of the pair of opposing flanges to form an inwardly protruding and longitudinally extending rib, said cold reduction of the flanges longitudinally precambering the building element.

2. A method as defined in claim 1 comprising the step of forming transversely extending corrugations in said at least one of the opposing flanges.

3. A method as defined in claim 2 wherein the transverse corrugations are in cross-section tapered longitudinally 20 wherein maximum corrugation is formed adjacent the corresponding rib.

4. A method as defined in claim 2 or 3 wherein the transverse corrugations are effective in removing the 25 precamber from the building element.

5. A method as defined in any one of the preceding claims wherein the step of cold reducing involves differentially stretching said portion of the flange to 30 form the rib.

6. A method as defined in claim 5 wherein the differential stretching is effected by compressing the flange with a variable force.

5 7. A method as defined in claim 2 also comprising the step of cold forming said at least one of the flanges whereby the corrugations are substantially flattened.

8. A method as defined in claim 7 wherein said cold  
10 forming of the flanges is effective in returning the longitudinal precamber to the building element.

9. An elongate metal building element of a channel section profile including a pan and a pair of opposing  
15 flanges each having an inwardly protruding and longitudinally extending cold reduced rib, the building element being precambered longitudinally.

10. A metal building element as defined in claim 9  
20 wherein said building element is one of a plurality of said building elements arranged alongside one another.

11. A metal building element as defined in claim 10 wherein adjacent building elements are connected together  
25 via an elongate cap being configured to locate about adjacent ribs of the respective and adjacent flanges.

12. A metal building element as defined in any one of claims 9 to 11 wherein said building element is  
30 constructed of a relatively light gauge and low tensile steel.

13. A metal building element as defined in any one of claims 9 to 12 wherein said building element is a metal roof panel.

5 Dated this 10th day of January 2002

BHP STEEL (JLA) PTY LTD

By their Patent Attorneys

GRIFFITH HACK

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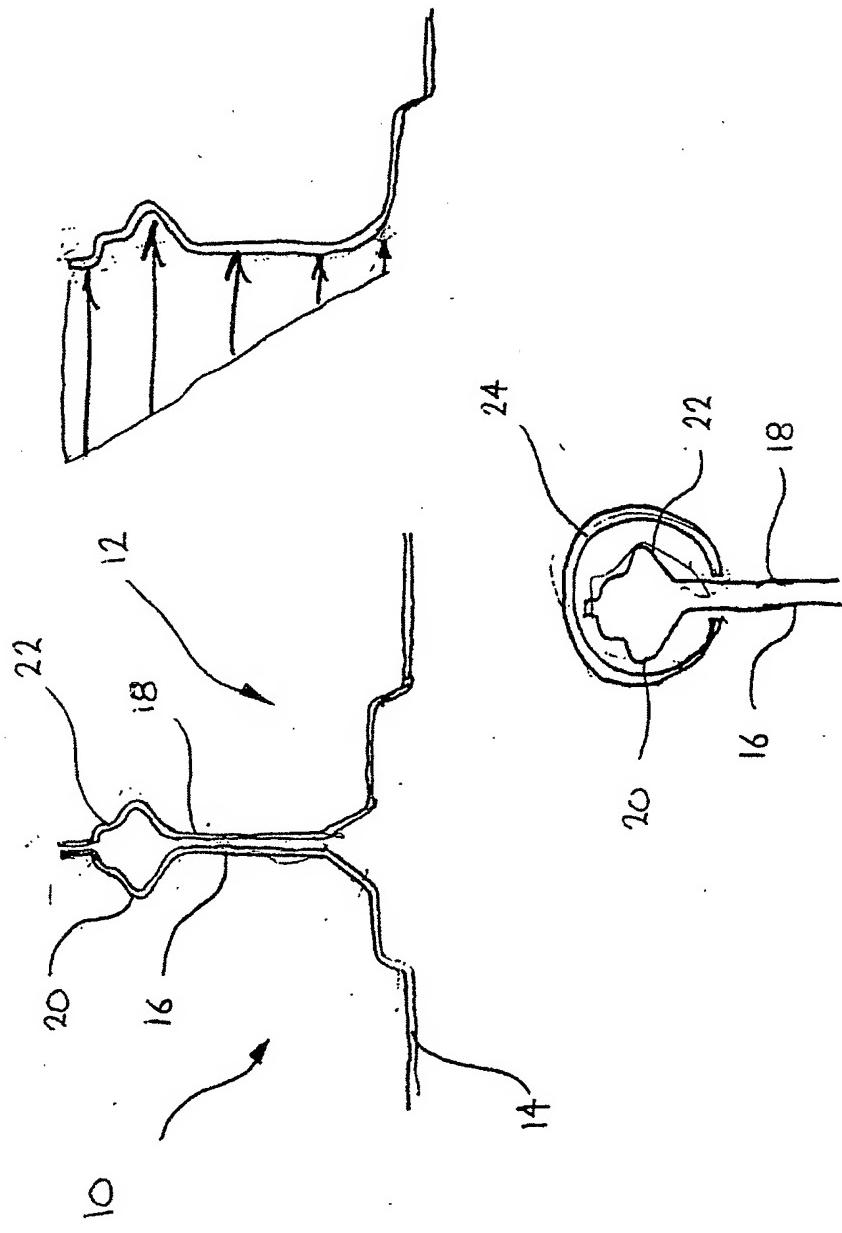


FIG. 1

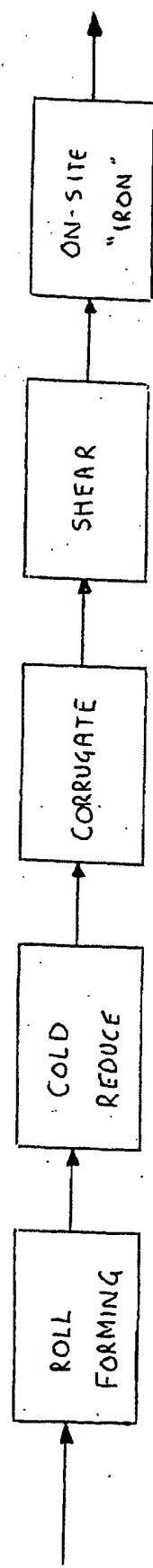


FIG. 2

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